10/031120

66722-012-7

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	) PATENT
	)
Jakob NIELSEN et al.	) Group Art Unit: Unknown
	)
Serial No.: (PCT/DK00/00380)	) Examiner: Unknown
	)
Filed: (7 July 2000)	)
	)
FEEDBACK CANCELLATION WITH	)
LOW FREQUENCY INPUT	)

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SUBMISSION OF INTERNATIONAL PRELIMINARY EXAMINATION REPORT
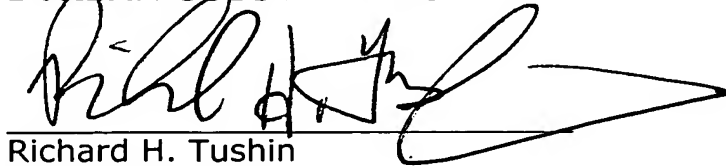
Washington, D.C.
January 28, 2002

Honorable Director for Patents
Washington, D.C. 20231

Sir:

The applicants herewith submit a copy of the International

Preliminary Examination Report, issued 24 October 2001.

Respectfully submitted,

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PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To: CHRISTENSEN, Mikael T. OTICON A/S Strandvejen 58 DK-2900 Hellerup DANEMARK	**PCT** NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT (PCT Rule 71.1)

	Date of mailing *(day/month/year)*　　24.10.2001

Applicant's or agent's file reference P-1999-014-2	**IMPORTANT NOTIFICATION**

International application No. PCT/DK00/00380	International filing date *(day/month/year)* 07/07/2000	Priority date *(day/month/year)* 19/07/1999

Applicant OTICON A/S et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. **REMINDER**

   The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

   Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

   For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/ European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Teschauer, B Tel.+49 89 2399-8231	

Form PCT/IPEA/416 (July 1992)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P-1999-014-2	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/DK00/00380	International filing date *(day/month/year)* 07/07/2000	Priority date *(day/month/year)* 19/07/1999

International Patent Classification (IPC) or national classification and IPC H04R25/00

Applicant OTICON A/S et al.

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 2 sheets.

3. This report contains indications relating to the following items:

   I   ☒   Basis of the report

   II   ☐   Priority

   III   ☐   Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

   IV   ☐   Lack of unity of invention

   V   ☒   Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement

   VI   ☐   Certain documents cited

   VII   ☒   Certain defects in the international application

   VIII   ☒   Certain observations on the international application

Date of submission of the demand 19/02/2001	Date of completion of this report 24.10.2001
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx 523656 epmu d Fax +49 89 2399 - 4465	Authorized officer Fribert, J Telephone No. +49 89 2399 8959

INTERNATIONAL PRELIMINARY
EXAMINATION REPORT

International application No. PCT/DK00/00380

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)):*
Description, pages:

1-13   as originally filed

Claims, No.:

1-9   with telefax of   20/08/2001

Drawings, sheets:

1/3-3/3   as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

☐ the description,   pages:

☒ the claims,   Nos.:   10-13

☐   the drawings,   sheets:

5. ☐   This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: No:	Claims Claims	1-9
Inventive step (IS)	Yes: No:	Claims Claims	1-9
Industrial applicability (IA)	Yes: No:	Claims Claims	1-9

2. Citations and explanations
   see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

Re Item V
Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. In order to assess novelty, inventive step and industrial applicability of the claims, the obscurities in claims 1 and 8 mentioned in Section VIII below has been interpreted in the light of the description, to mean that the high pass filters prevent low frequency signals contained in the speaker signal from entering the LMS algorithm while low frequency signals from the feedback cancellation filter and the noise generator can be input to the LMS algorithm.

2. The closest prior art is described on pages 1 and 2 of the description and is shown in Fig. 1.

3. Object: To provide a method and a hearing aid having means for feedback cancellation, which improves the result of the feedback cancelling by being more stable and thereby gives an improved user comfort.

4. Solution: Provision of a high pass filter preventing low frequency signals contained in the speaker signal from entering the LMS algorithm while low frequency signals from the feedback cancellation filter and the noise generator can be input to the LMS algorithm.

5. These features are not known from any of the prior art documents of the search report and are thus not rendered obvious. Thus, there is no hint in the prior art to enable the person skilled in the art to arrive at a method according to claim 1 or a hearing aid according to claim 8 without the exercise of inventive skill.

   The advantage of the invention is that the LMS algorithm is controlled in a more reliable manner hereby providing more reliable coefficients to the feedback cancellation filter.

6. Claims 1 and 8 equals original claims 1 and 9 respectively.

7.   Claims 2 to 7 and 9 are dependent on claims 1 and 8, respectively and as such
     also meet the requirements of the PCT with respect to novelty and inventive step.

Re Item VII
Certain defects in the international application

1.   The features of the claims are not provided with reference signs placed in
     parentheses (Rule 6.2(b) PCT).

2.   The description page 2, lines 19-21 and 28-30 has not been adapted to the
     amended claims.

Re Item VIII
Certain observations on the international application

1.   The claims are not clear and concise contrary to Article 6 PCT for the following
     reasons:

     (a)   The wording of claim 1 is obscure, due to the fact that it first claims a high
           pass filter preventing low-frequency signals entering the algorithm and then
           claims a filter and a noise generator providing low frequency signals to the
           algorithm.

     (b)   This objection is also valid against independent claim 8.

CLAIMS

1.   A method for canceling feedback in an acoustic system comprising a microphone, a signal path, a speaker, means for detecting presence of feedback between the speaker and the microphone and filter means for compensating at least partly a possible feedback signal, the method comprising:
   - using a LMS algorithm for generating filter coefficients
   - using a highpass filter to prevent low-frequency signals from entering the LMS algorithm;
   - where an additional feedback cancellation filter and a noise generator is used for providing low-frequency input for the LMS algorithm.

2.   A method according to claim 1, where a sign-swapping algorithm is used for generating a broad band noise signal, having an amplitude substantially equal to the amplitude of the signal from which it was derived.

3.   A method according to any of the claims 1 or 2 where a steep low pass filter is used generate a low frequency noise signal to be used as an additional input to the LMS algorithm.

4.   A method according to claim 1, where the LMS algorithm operates with a predetermined essentially level independent adaptation speed when feedback is not present, this representing a first mode
   - where the LMS algorithm operates a level dependent adaptation speed when feedback is present, this representing a second mode;
   - where the means for detecting the presence of feedback is used to control the adaptation mode selection of the LMS algorithm;
   - where the update rate for the LMS algorithm is determined by the long-term average denominator in the LMS update algorithm in the second mode.

5.   A method according to any of the claims 1-4, comprising a microphone, a signal path, a speaker, means for detecting presence of feedback between the speaker and the microphone and filter means for at least partly compensating a possible feedback signal, the method comprising:

- using bandwidth detection means for determining the presence of a feedback signal.

6.   A method according to any of the claims 1-5, where the stability of the signal determined as a feedback signal is analyzed.

7.   A method according to any of the claims 1-6, where the feedback analyzing comprises holding flag values from a number of succeeding time frames and comparing of these.

8.   A hearing aid comprising:
   - a microphone;
   - a signal path;
   - an amplifier;
   - a speaker;
   - means for detecting feedback between the speaker and the microphone;
   - filter means for at least partly compensating a possible feedback signal;
   - memory means including a LMS algorithm for generating filter coefficients;
   - at least one highpass filter for preventing low-frequency signals from entering the LMS algorithm;
   - an additional feedback cancellation filter and a noise generator for providing low-frequency input for the LMS algorithm.

9.   A hearing aid according to claim 8, further comprising steep low pass filters for generating a low frequency noise signal to be used as an additional input to the LMS algorithm.